

CLAIMS

WHAT IS CLAIMED:

1. A method comprising:
forming a dielectric layer above a structure layer;
forming a hard mask layer above the dielectric layer;
forming at least one trench opening and at least one upper portion of a first via opening in the dielectric layer through the hard mask layer; and
forming a low viscosity photoresist layer above the at least one trench opening and the at least one upper portion of the first via opening in the dielectric layer.
2. The method of claim 1, further comprising:
forming a second via opening in the at least one trench opening, the second via opening extending down through the dielectric layer to the structure layer; and
forming a lower portion of the first via opening in the dielectric layer, the lower portion extending down through the dielectric layer to the structure layer.
3. The method of claim 2, further comprising:
forming at least one barrier layer above the dielectric layer and in the at least one trench opening and in the first and second via openings;
forming at least one seed layer above the at least one barrier layer; and
forming a conductive layer above the at least one seed layer.

4. The method of claim 3, further comprising:

planarizing the conductive layer, removing the hard mask layer above the dielectric layer.

5. The method of claim 1, wherein forming the dielectric layer comprises forming the dielectric layer using a low dielectric constant (low K) dielectric material, having a dielectric constant K of at most about four.

6. The method of claim 1, wherein forming the dielectric layer comprises forming the dielectric layer using at least one of chemical vapor deposition (CVD), low-pressure CVD (LPCVD), plasma-enhanced CVD (PECVD), sputtering, physical vapor deposition (PVD), and spin-on glass.

7. The method of claim 1, wherein forming the hard mask layer above the dielectric layer comprises forming the hard mask layer using at least one of silicon oxynitride and tetraethyl orthosilicate (TEOS).

8. The method of claim 1, wherein forming the hard mask layer above the dielectric layer comprises forming the hard mask layer to be used as an antireflection coating (ARC).

9. The method of claim 3, wherein forming the conductive layer comprises forming the conductive layer using electrochemical deposition of copper.

10. The method of claim 9, wherein using the electrochemical deposition of the copper comprises planarizing the copper using chemical mechanical polishing after the electrochemical deposition of the copper.

5 11. A method comprising:

forming a dielectric layer above a conductive structure;

forming a hard mask layer above the dielectric layer;

forming at least one trench opening and at least one upper portion of a first via opening in the dielectric layer through the hard mask layer; and

forming a low viscosity photoresist layer above the at least one trench opening and the at least one upper portion of the first via opening in the dielectric layer.

10 12. The method of claim 11, further comprising:

15 forming a second via opening in the at least one trench opening, the second via opening extending down through the dielectric layer to the conductive structure; and

forming a lower portion of the first via opening in the dielectric layer, the lower portion extending down through the dielectric layer to the
20 conductive structure.

13. The method of claim 12, further comprising:

forming at least one barrier layer above the dielectric layer and in the at least one trench opening and in the first and second via openings;

25 forming at least one seed layer above the at least one barrier layer; and

forming a conductive layer above the at least one seed layer.

14. The method of claim 13, further comprising:

planarizing the conductive layer, removing the hard mask layer above the
dielectric layer.

15. The method of claim 11, wherein forming the dielectric layer comprises
forming the dielectric layer using a low dielectric constant (low K) dielectric material, having
a dielectric constant K of at most about four.

16. A method comprising:

forming a dielectric layer above a copper structure;

forming a hard mask layer above the dielectric layer;

forming at least one trench opening and at least one upper portion of a first via
opening in the dielectric layer through the hard mask layer; and

forming a low viscosity photoresist layer above the at least one trench opening
and the at least one upper portion of the first via opening in the
dielectric layer.

17. The method of claim 16, further comprising:

forming a second via opening in the at least one trench opening, the second via
opening extending down through the dielectric layer to the copper
structure; and

forming a lower portion of the first via opening in the dielectric layer, the lower portion extending down through the dielectric layer to the copper structure.

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18. The method of claim 17, further comprising:

forming at least one barrier layer above the dielectric layer and in the at least one trench opening and in the first and second via openings;
forming at least one copper seed layer above the at least one barrier layer; and
forming a copper layer above the at least one copper seed layer.

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19. The method of claim 18, further comprising:

planarizing the copper layer, removing the hard mask layer above the dielectric layer.

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20. The method of claim 16, wherein forming the dielectric layer comprises

forming the dielectric layer using a low dielectric constant (low K) dielectric material, having a dielectric constant K of at most about four.

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21. A device formed by a method comprising:

forming a dielectric layer above a structure layer;
forming a hard mask layer above the dielectric layer;
forming at least one trench opening and at least one upper portion of a first via opening in the dielectric layer through the hard mask layer; and

forming a low viscosity photoresist layer above the at least one trench opening
and the at least one upper portion of the first via opening in the
dielectric layer.

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22. The device of claim 21, the method further comprising:

forming a second via opening in the at least one trench opening, the second via
opening extending down through the dielectric layer to the structure
layer; and

forming a lower portion of the first via opening in the dielectric layer, the
lower portion extending down through the dielectric layer to the
structure layer.

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23. The device of claim 22, the method further comprising:

forming at least one barrier layer above the dielectric layer and in the at least
one trench opening and in the first and second via openings;

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forming at least one seed layer above the at least one barrier layer; and

forming a conductive layer above the at least one seed layer.

24. The device of claim 23, the method further comprising:

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planarizing the conductive layer, removing the hard mask layer above the
dielectric layer.

25. The device of claim 21, wherein forming the dielectric layer comprises

forming the dielectric layer using a low dielectric constant (low K) dielectric material, having

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a dielectric constant K of at most about four.

26. The device of claim 21, wherein forming the dielectric layer comprises forming the dielectric layer using at least one of chemical vapor deposition (CVD), low-pressure CVD (LPCVD), plasma-enhanced CVD (PECVD), sputtering, physical vapor deposition (PVD), and spin-on glass.

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27. The device of claim 21, wherein forming the hard mask layer above the dielectric layer comprises forming the hard mask layer using at least one of silicon oxynitride and tetraethyl orthosilicate (TEOS).

28. The device of claim 21, wherein forming the hard mask layer above the dielectric layer comprises forming the hard mask layer to be used as an antireflection coating (ARC).

29. The device of claim 23, wherein forming the conductive layer comprises forming the conductive layer using electrochemical deposition of copper.

30. The device of claim 29, wherein using the electrochemical deposition of the copper comprises planarizing the copper using chemical mechanical polishing after the electrochemical deposition of the copper.

31. A device comprising:
- a structure layer;
 - a dielectric layer above the structure layer;
 - a hard mask layer above the dielectric layer;

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